

Corporate sector vulnerability analysis from probability of default

The MPC places importance on monitoring and analyzing the health of the corporate sector because the corporate sector is the major production, investment, and employment unit. As the main borrower of financial institutions, it is also vital for financial stability. Should the corporate sector's ability to service debt become impaired, non-performing loans (NPLs) in the banking system could rise. Indeed, the sector's financial distress can adversely affect the banking system through the erosion of the value of collaterals held against loans as well as the value of securities held as investment by banks. In this light, corporate sector fragility is a significant source of risk to financial institutions' liquidity and solvency. Moreover, problems that occur at one financial institution could grow into a systemic one, like the financial crisis that is currently playing out in the US and global markets.

This article outlines how a probability of default (PD) model can help in an assessment of corporate sector stability. In general, a common method to assess corporate sector soundness relies on the use of a wide array of financial ratios. For example, operating profit margin is used to analyze corporate profitability while debt-to-equity ratio is used to measure the strength of the financial structure. However, financial ratio analysis does have its limitations, of which the inconsistency among indicators and difficulty in searching for appropriate vulnerability thresholds are a few. An alternative method is therefore created, which combines key financial ratios into a comprehensive indicator of corporate sector vulnerability - the probability of default.

A probability of default can be calculated through several approaches. One of the most commonly used approaches is the random-effect probit model. In our case, data used in the model are obtained from financial statements of non-financial corporations listed on Stock Exchange of Thailand (SET) during 1994 Q1 to 2008 Q2. The model is expressed as follows.^{1/}

$$y_{it}^* = a \cdot OPM_{it} + b \cdot DA_{it} + c \cdot Kd_{it} + d \cdot CR_{it} + \mu + \varepsilon_{it}$$

where y_{it}^* denotes the unobserved (or latent) default status of firm i at time t and corresponds to the observed variable, y_{it} , which equals 1 if the interest coverage ratio (ICR)^{2/} is less than 1 for four consecutive quarters (that is, a firm does not have sufficient income to repay interest on loans) and equals 0 in other cases; μ is the random-effect coefficient while the error term, ε_{it} , is assumed to be distributed normally.

Independent variables in the model indicate sources of vulnerability, which varies inversely with the probability of default and are represented by key financial ratios as follows:

Operating profit margin (OPM)^{3/} reflects firm's profitability and capability to service debt. Higher operating profit margin leads to higher ability to service debt, and in effect, lower probability of default.

^{1/} The probit function can be written as $\Pr(y_{it} = 1 | X_{it}, \beta) = \Phi(X_{it}'\beta)$, where Φ is standard normal cumulative distribution function; $y_{it} = 1$ if $y_{it}^* > 0$ and $y_{it} = 0$ if $y_{it}^* < 0$; X_{it} is vector of independent variables; and the coefficient vector β is estimated by Maximum Likelihood Estimation (MLE).

^{2/} Interest coverage ratio (ICR) = Earning before interests and taxes (EBIT)/Interest expense.

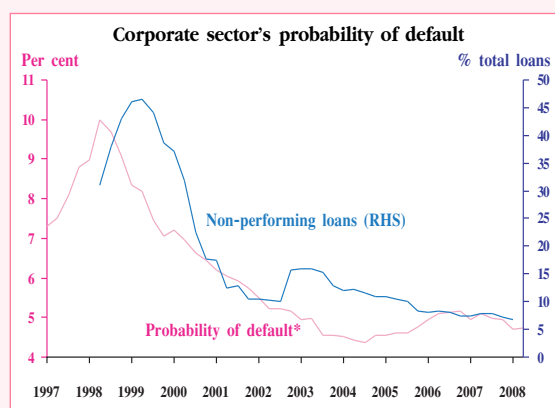
^{3/} Operating profit margin = Operating profit / sales x 100.

Debt-to-asset ratio (DA)^{4/} reflects firm's degree of leverage and sensitivity to interest rate shocks. With high leverage, firms are largely exposed to interest rate changes, which can result in lower ability to service debt and higher PD.

Average cost of debt (Kd)^{5/} provides information about firm's financing costs. If firms' external funding is costly, its debt servicing ability can decline and consequently it can have a high PD.

Current ratio (CR)^{6/} measures firm's liquidity. If a firm has ample liquidity, the probability of bankruptcy should be lower.

Using the model, the PD can be calculated as a marginal effect for each firm in a given period, i.e. the likelihood of a firm's default given changes in the key financial ratios at any date. The median of all firms' PD can give a measure of overall likelihood of corporate default. Furthermore, it is found that the calculated PD leads the NPL ratio by 3 quarters with correlation of 0.95. As a result, the PD obtained from this model can be used as a good indicator for corporate sector vulnerability as well as for risk to financial institutions.



Note: *Median of listed companies in the Stock Exchange of Thailand (SET)
Source: Stock Exchange of Thailand, calculated by Bank of Thailand

In recent years, the probability of default at the corporate-sector level in Thailand has remained at around 5 per cent, which is low compared with the levels seen pre-1997. However, PD has risen slightly since 2006 as profitability started to decline on the back of an economic slowdown and declining international competitiveness of certain export industries. Nevertheless, the corporate sector's leverage and liquidity have substantially improved, reflecting healthy financial status.

Probability of default can help analyze corporate sector vulnerability. However, this analysis also has some limitations. The PD indicator calculated from the model relies on past data and therefore may not be forward-looking. In addition, the model's probability of default is generated by direct credit risk and does not capture other sources of credit risks; for example, those that are market driven. In corporate sector vulnerability assessment, a more complete picture can be gleaned through the use of other indicators in conjunction with the outlined probability of default model.

^{4/} Debt to asset ratio = Liabilities / Assets.

^{5/} Average cost of debt = $(D_1Kd_1 + D_2Kd_2 + \dots + D_nKd_n) / (D_1 + D_2 + \dots + D_n)$, where D_n is the debt amount from source n and Kd_n is the cost of debt from source n .

^{6/} Current ratio = Current assets / Short-term liabilities.